

## Short Communication

# The first report of an alien parasitic nematode, *Camallanus cotti* isolated from the wild Giant danio fish, *Devario aequipinnatus*, (Teleostei: Cyprinidae) from southern part of Western Ghats, India

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**Abstract:** Introduction of alien parasitic nematodes to the wild fish species might result in a severe threat to native species biodiversity including native fish species and native parasitic fauna. In the present study, the invasive Asian nematode, *Camallanus cotti* (Nematoda: Camallanidae), has been reported for the first time in Giant Danio (*Devario aequipinnatus*) in the Cauvery river systems of Southern part of Western Ghats, India. The occurrence of this parasite in both aquarium-cultured fish as well as from the natural aquatic bodies dwelling fish is evident of the introduction of the alien organisms due to insufficient prophylactic measures during the transmission of non-native hosts between countries and also the spread of them by the anthropogenic introduction to natural systems.

**Keywords:** Nematoda, Alien parasites, Exotics, Freshwater, Asia.

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### Introduction

The Western Ghats of India is one of the 34 biodiversity 'hotspot' areas of the world. The rate of endemism here is well reflected in the case of lower vertebrates especially with regard to fishes. Of the 300 species of freshwater fishes in the Western Ghats, 155 are considered as ornamental fishes, of which 117 are endemic to the Western Ghats regions (Gopalakrishnan & Ponniah 2000). The Giant danio (*Devario aequipinnatus*), a tropical fish belonging to the Cyprinidae family, is an active and luminously barred hill stream fish that has a great value as an ornamental fish market. It is a native fish of India and is widely dispersed in Asia, Nepal and Sri Lanka. It inhabits hill streams up to an altitude of 300m and which does not reach more than 15 cm (Talwar & Jhingran 1991). It survives in shaded, mid-hill pristine waters with pebble or gravel substrates and occurs in schools at the top of the small high-gradient

upstream (Pethiyagoda 1994). It mainly feeds on insects (Rainboth 1996) and also on larvae and crustaceans (Mills & Vevers 1989). Due to the low food value, this fish is not found in local markets, but common in ornamental trade (Arunachalam et al. 2000). The Giant danio, *D. aequipinnatus* is proposed to be a model species as it has pertained a great importance in the field of developmental genetics, functional genomics, aquatic toxicology, neuro science and in many areas of biomedical research (Raja et al. 2015).

The species of *Camallanus cotti* (Spiruridea: Camallanidae) is a potential fish pathogen that can affect host behavior and even cause death (McMinn 1990). It is commonly found in many species of the Cypriniformes, Siluriformes, and Perciformes (Kim 2002). *Camallanus cotti* was first described by Fujita (1927a, b) from Lake Biwa and Lake Tazawa in Japan in the fish species; later Yamaguti (1935, 1941)

and Moravec & Nagasawa (1989) re-described it from the fresh samples gathered from various Japanese fishes. This nematode has been accounted from various fish species belongs to different families and orders (Fujita 1927a, b). In September of 2017, a sample of fishes was collected from the Cauvery river systems of Stanley reservoir, Tamil Nadu, where one native fish species was found to be effected with the speciously exotic nematode, *C. cotti*, a pathogenic parasitic organism of numerous fish species familiarized from East Asia to many countries of diversified continents. In the present work, the nematode *C. cotti* Fujita, 1927 (Nematoda: Camallanidae) is reported from the Giant Danio, *D. aequipinnatus* for the first time from the southern part of Western Ghats.

#### Materials and Methods

The wild specimens of *D. aequipinnatus* were collected the Cauvery river at Stanley Reservoir, (11°54'18.3"N 77°53'15.8"E) Salem District, Tamil Nadu, India, during September to November 2017, using drag net (Fig. 1). The helminthological dissection of the fish and examining mainly the digestive tract as well as the abdominal cavity, throat and gills. The parasites were gently removed from the fish with the use of sharp twistors and were placed in a petridish of water to relax them while warming up 70% ethanol in which they were fixed in for about 5 minutes to straighten them up. The straightening of the nematodes is very important as it makes it easier for further laboratory observations. The isolated nematodes were preserved in 10% buffered formalin. For the examination of the fixed nematode specimens, the external morphology was confirmed using a binocular stereozoom microscope (Optika-SZ61TR) with transmitted light. Relative parameters were measured and identification was performed using (Bauer 1987; Anderson 2000; Moravec 2000) keys. The studied individuals (preserved in 70% ethanol) have been deposited to the Periyar University Museum of Natural History (PUMNH), Department of Biotechnology Salem, Tamil Nadu



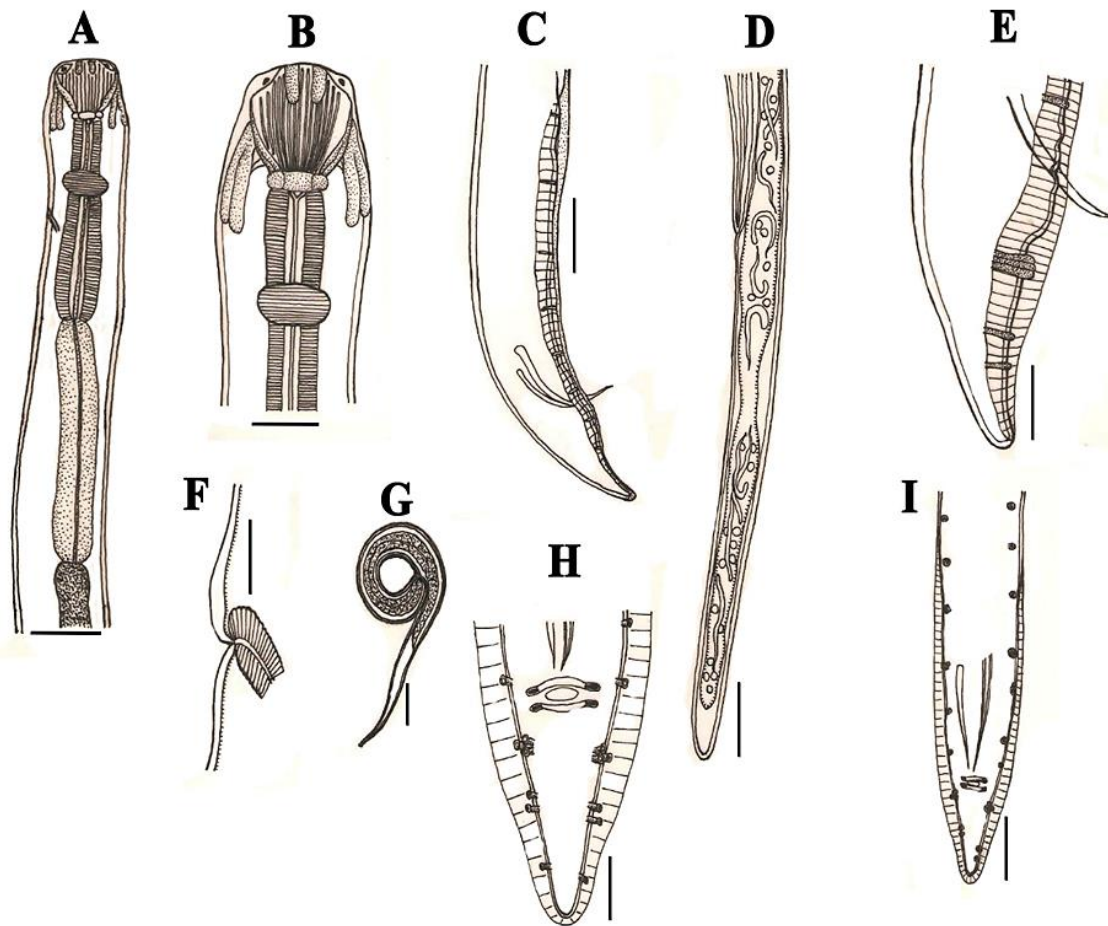
**Fig.1.** High infection with *Camallanus cotti* in *Devario aequipinnatus* from the Cauvery river systems of Stanley reservoir, southern part of Western Ghats.

(India) under museum numbers PUMNH 01-09/2017.

#### Results

Morphological examination of the nematodes found in the intestinal tract of live fishes *D. aequipinnatus* collected in this study, revealed that it belongs to the genus, *Camallanus* Anthony, 1958 (Fig. 1). The first evidence of infection is a red, worm like animal protruding from the anus of a fish. Area near anus where worm is sticking out from lot of activity not all worms. This finding is based on the large orange-brown buccal capsule, finely transversely striated uticle and the medium-size of the worms which are typical for the genus (Fig. 2).

**Description (based on of 4 male and 5 female individuals from present collections):** Medium-sized nematodes with finely transversely striated fingernail skin and extensively dark orange buccal case runs from the characteristic of genus. Mouth gap slit



**Fig.2.** *Camallanus cotti* Fujita, 1927, fourth-stage larva from *Devario aequipinnatus*. A, B front (oesophageal) portion of male body, horizontal view, C back end of male, lateral view, D tail of sub gravid female, lateral view, E tail of male, lateral view. F – Vulva of gravid female, horizontal view. G – Larva from uterus H, I – back end of male, ventral and lateral views; Scale bars: A, B, D= 200 $\mu$ m; C, E, H, I=100 $\mu$ m; F, G=50  $\mu$ m.

shaped, encompassed by four sub median cephalic papillae anteriorly clear in male worms and both lateral amphids. Valves of buccal case generally pentagonal in horizontal view, within bearing smooth nine longitudinal edges, some deficient, wide-ranging on length for both sexes. Foremost external surface of every valve with two longitudinally prolong sclerotized plates. Slender, sclerotized ring was present at the base of capsule. Back end of buccal cavity was encompassed by thick, sclerotized ring (basal ring) bolstered by 2 noticeable tridents having 3 prongs. Focal prongs little, barely unmistakable. Esophagus isolated into front strong and back glandular bits. Glandular bit longer and most extensive than muscular ones. Digestive tract straight, wide. Nerve ring encloses the midregion of

solid esophagus in males: however, in females, it surrounds the front region of muscular esophagus. Deirids little, somewhat asymmetrical, situated at around 65% of muscular esophagus. Excretory pore somewhat back to level of nerve ring. Male worms displaced two unequal spicules, generally slim, adjusted anteriorly and pointed posteriorly. Substantial (left) spicule 1.5 times longer than little (right) spicule. Females vulva little with marginally lifted lips, postequatorial. Strong vagina coordinated posteriorly from vulva joining the uterus which contain various, smooth eggs. Tail small, decreasing to bifid, spiked tips in both sexes.

#### Discussion

During the present investigation, the nematode



*C. cotti* Fujita, 1927 (Nematoda: Camallanidae) is reported from the *D. aequipinnatus* for the first time from southern part of Western Ghats, India. The nematode, *C. cotti* infects the gastro intestinal track of live fishes. The first evidence of infection is a red, worm like animal protruding from the anus of a fish. Area near anus where worm is sticking out from lot of activity not all worms. The parasitic nematodes *C. cotti* attaches itself to the wall of the gastrointestinal tract of fish hosts by their buccal capsule, feeding on host blood or tissue fluid. This infection could cause rectal inflammation, subsequent anemia, emaciation, and occasionally even death of the fish, especially in small fish (Stumpp 1975). *C. cotti* exhibits a complex life cycle under natural conditions and an intermediate host (cyclopoid copepod) is considered to be essential for the completion of its life cycle (Levsen & Berland 2002a).

This worm has spread to aquarium and wild fishes around the world and has to date been reported from different fish hosts and different geographical areas only. Almost no data about the protozoan parasites is accessible from India. A portion of the work has been done in West Bengal (Mitra 2013). *Camallanus cotti* has been accounted for from a various fish species having a place with various different families and orders. It appears, it was initially dispersed in eastern, southeastern and southern Asia, from where it has been recorded from Japan, China, eastern Russia (Amur R. basin), Korea, Vietnam, Singapore and India (Li 1941; Dogiel & Akhmerov 1959; Roytman 1963; Raina & Dhar 1972; Chen 1973; Petter 1974; Wang et al. 1979; Wang et al. 1997; Wu 1984; Vismanis et al. 1987; Moravec & Sey 1988; Wu et al. 1991; Moravec 2004). It was likewise found to occur in the cultures of aquarium fishes in Europe, North America (Canada), South America (Brazil), West Indies (Puerto Rico) and Australia, where this pathogenic parasite is being gotten alongside extraordinary fishes, imported for the most part from Singapore (Schubert 1972; Campana-Rouget et al. 1976; Font & Tate 1994; Alves et al. 2000; Evans &

Lester 2001; Levsen 2001; Levsen & Jakobsen 2002; Menezes et al. 1927). Vincent & Font (2003a, b; Noei et al. 2015; Ukwa et al. 2018) examined the seasonal and yearly structure of *C. cotti* and *Bothriocephalus acheilognathi* parasitizing exotic fishes in Hawaii, while *C. cotti* showed a higher prevalence and mean abundance in summer than in winter, *B. acheilognathi* showed a low prevalence and abundance in both seasons. Considering the importance of characterization of the parasites in wild freshwater fishes, the present paper illustrates the first record and detailed description of morphological characters of the *C. cotti* recovered from *D. aequipinnatus*. Those will enable the parasitologists to identify the species and compare the conspecific species recovered from other studies.

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## یافته علمی کوتاه

# اولین گزارش یک انگل نماتود غیربومی *Camallanus cotti* جدا شده از ماهی دانیو غول پیکر *Devario aequipinnatus* (ماهیان استخوانی عالی: کپورماهیان) از بخش جنوبی گهات غربی

## هند

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**چکیده:** معرفی گونه‌های نماتود بیگانه به ماهیان وحشی ممکن است تهدید شدیدی برای تنوع زیستی بومی از جمله گونه‌های ماهیان بومی و فون انگل‌های بومی باشد. در این مطالعه نماتود مهاجم آسیایی *Camallanus cotti* (کرم‌های لوله‌ای: کامالانیده) برای اولین بار از نمونه‌های وحشی ماهی دانیو غول پیکر *Devario aequipinnatus* از سیستم‌های رودخانه‌ای Cauvery بخش جنوبی گهات غربی هند گزارش می‌گردد. حضور این نماتود هم در ماهیان آکواریومی و هم در منابع آبی طبیعی دارای ماهی، نشان دهنده معرفی این موجودات بیگانه به دلیل کافی نبودن اقدامات پیشگیرانه در طی انتقال میزبان‌های غیر بومی بین کشورها و پراکنش آنها در منابع آبی طبیعی در اثر فعالیت‌های انسانی است.

**کلمات کلیدی:** کرم‌های لوله‌ای، انگل‌های بیگانه، غیربومی، آب‌های شیرین، آسیا.